STUDIES ON AVIAN FAUNA OF PONG DAM LAKE WILDLIFE SANCTUARY, HIMACHAL PRADESH

SYNOPSIS OF THE THESIS

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CERTIFICATE

This is to certify that the synopsis of the thesis titled **"Studies on avian fauna of Pong dam lake wildlife sanctuary, Himachal Pradesh"** is an original piece of work done by Ms. Anuradha (Registration no. AU20ZOPhD0045), under our supervision for the degree of Doctor of Philosophy (Zoology) in Abhilashi University Chail-Chowk Mandi, Himachal Pradesh. It is also certified that this work has not been submitted to any other University for a Ph.D. degree.

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INTRODUCTION

Earth is the home to many creatures with many strange and diverse features. All the diversity on this planet behave differently, yet all of them are related. Variability among living creatures from various sources- including terrestrial, grassland, marine and fresh water aquatic ecosystems and the ecological complexes, of which they are the part- is referred as Biological diversity (Millennium Ecosystem Assessment, 2005). It is a part of nature and encompasses variety of biological life at more than one scale including the differences in genes among the individuals of a species (genetic diversity), different type of ecosystem within defined area (ecosystem diversity) and variety of plant and animal species (species diversity) in different regions of the world. Biodiversity is about sustaining the natural area which includes community of various species of plants, animals and other living organism such as micro-organism along with land and water that is being reduced at high pace due to anthropogenic activities. It provides wide range of social, cultural, ecological, educational, aesthetic, economic and scientific services to mankind.

Estimates of total number of species in the world vary from 5 million to over 50 million (May, 1998). Chapman (2009) documented 1,899,587 eukaryotic species worldwide, which are further categorized as chordates- 64,788, invertebrates- 1,359,365, plants- 310,129, fungi- 98,998 and others- 66,307 species. Amongst chordates further categorization include, mammals- 5487, birds- 9990, reptiles- 8734, amphibians- 6515, fishes- 31153, cephalochordates- 33 and tunicates- 2760 species.

Birds are the most beautifying creativity of God that enhances the earth's diversity and inhabit the land, sea and fresh water with wide-ranging habitats from lower to higher regions. They are described as feathered bipeds (Ali, 2002), glorified reptiles, beak with no teeth, hard calcareous egg shell, warm blooded with more or less constant temperature, diverse body pattern, plumage, coloration which lead to sexual dimorphism, keen ability to fly for inhabiting every type of ecosystem across the globe and so on. Due to presence of various attribute such as pneumatic/hollow bones, warm bloodedness, feathers, modification of forelimb into wings and power of flight, the

phenomenon of migration exhibits at highest level, which is one of the most enthralling branches for the study of bird life. They have the ability of adaptation or to change themselves which makes possible for them to live in various environmental conditions. Their distribution is worldwide which shows variation in their diversity, abundance, richness, evenness and habitat.

LITERATURE REVIEW

Global Avifaunal Diversity:

A lot of work has been done across the world on the morphology, distribution, conservation of birds in different zones and areas of globe. Among the zoogeographic regions, Neotropical realm (central and south America) represents the most diverse realm contributing 36% of land birds, followed by Ethiopian realm (Africa) contributing 21%, Oriental realm (South east Asia and nearby Island) possess 18%, Australasian realm (Australian and Newly Guinea) represents 17%, Palaearctic realm (Eurasian region) holds 10%, Nearctic realm (North America-Greenland) holds 8% and least contributed by Oceanic realm holds 2% of land birds. Across the world, 10,000 diverse species of birds represents the major portion (approximately 80%) at continental regions.

Ali (1941) determined an estimation of 8600 avian species across the world; Sibley and Monroe (1993) reported 9672 avian species of 2057 genera comprising 144 families and 29 orders**;** 9600 avian species underneath 2029 genera with 187 families and 29 orders (Gill, 1995). These are the most highly valued element of natural world, including greater than eleven thousand varieties of species; ranging from humming bird to ostriches and from penguins to eagles, uniqueness in its appearance, behavior, habits and habitat (Bird Life International, 2018).

Avifaunal Diversity in India:

India is endowed with unique habitat (as a result of edge effect of three biogeographic regions), real emporium of aromatic and medicinal plants, genetic as well as species biodiversity, varied ecosystem like mountain, desert, forest, and rivers;

possess three of the world's 35 biodiversity hotspots located in Eastern Himalayas, Western Ghats, Indo-Burma and holds a position among 17 mega bio-diverse nations of the world. It harbors a rich biodiversity due to heterogeneity of physical features, distinctive ecological history and extreme eco-climatic variations from tropical to temperate. The Ministry of Environment and Forests in India surveyed about 70% of total geographical area representing 45,500 plant species (including fungi and lower plants) and 91,000 animal species.

A total of 1299 bird species, constituting about 13-14% of the total world avifauna have been reported from this subcontinent (Inskipp *et al*., 1999). According to Agrawal (2000), an estimation of 2546 fish species, 204 amphibian species, 446 reptilian species, 1228 avian species and 372 mammalian species were reported from India. Ali and Ripley (2001) recorded 1260 avian species; Praveen *et al*. (2016) described 1263 species accounting 12% of the world avian fauna and categorized into 498 genera, 107 families and 23 orders representing 21%, 45% and 64% of world's avifauna, respectively. The Birdlife International (2021) described 1210 species of birds in India, accounting 94 species as Globally Threatened (Vulnerable; Endangered and Critically endangered), 78 species as Near-Threatened, 1037 species as Least concern and one species as Data deficient.

A number of avian checklists had been prepared to describe the diversity blossoming in the country (Johnsingh and Joshua, 1994; Jayson and Matthew, 2000; Manjunath and Joshi, 2012; Upadhyay *et al.*, 2020; Bharadwaj and Prasad, 2021; Rather and Shrivastava, 2021).

Avifaunal Diversity in Himachal Pradesh:

The earliest records on the study of birds of Himachal Pradesh have been listed from Theobald (1862) to Dodsworth (1914). Ali (1949) has compiled information on about 225 bird species from Western Himalayan region. Mahabal and Sharma (1992) reported the presence of 133 species of birds belonging to 46 families and subfamilies

along with their altitude wise abundance in different zones of Kangra district of Himachal Pradesh. Moreover, bird survey by Mahabal (1996) in Shiwalik Himalaya covering the district of Una, Hamirpur and Bilaspur revealed the presence of 136 species belonging to 41 families alongwith their status and distribution range. Sharma and Mahabal (1997) conducted studies on seasonal changes in bird species in two different altitudinal locations of Solan district. Various sites of district Kangra, including the Pong wetland, were explored by Besten (2004) and he reported 555 avian species from this area. Avifauna of Wildlife Sanctuaries and National Parks of Himachal Pradesh has been explored by many workers like Pandey (1989) who observed some 220 species of birds from the Pong Dam Wetland, Kangra. Singh *et al*. (1990) enlisted about 358 birds from 2 National Parks and 29 Wildlife Sanctuaries of Himachal Pradesh.

Thakur and Mattu (2012) recorded the presence of 322 species belonging to 190 genera under 60 families and 17 orders from 7 localities of Himachal Pradesh. Singh and Banyal (2013) reported 77 species of birds from Khajjiar area of Chamba district. Singh *et al.* (2014) recorded a total of 95 bird species in Prashar lake and its surrounding area in Mandi district. Chandertal wetland sanctuary of Lahaul & Spiti was explored by Rana *et al.* (2014) and they described 41 species of bird in this area. Negi *et al.* (2015) observed 73 avifaunal species in Rakchham Chhitkul wildlife sanctuary of Kinnaur. Paliwal *et al*. (2019) studied the avifaunal diversity of Bandli wildlife sanctuary in Mandi district and reported a total of 70 species. Kumar (2021) described 114 bird species belonging to 42 families in the Shahpur area of district Kangra.

RESEARCH GAP IDENTIFICATION

A review of published records of avifaunal diversity and distribution revealed that a lot of exercise to explore birds of Himachal Pradesh has been carried out by various researchers. Few studies on bird diversity of Pong dam lake area have also been recorded by researchers such as Pandey (1989), Besten (2004) and others. However in all these studies only the general bird species diversity of the area was reported. There is very least research work involving more scientific analysis of avifaunal diversity data of

Pong dam lake wildlife sanctuary. So, keeping this in mind, the present study is planned with following objectives.

OBJECTIVES

The present study has been planned with following objectives:

1. To study the diversity and habitat use pattern of avifauna in Pong dam lake wildlife sanctuary, Kangra, Himachal Pradesh.
2. To elucidate the comparative relative abundance and residential status of the reported bird species.
3. To assess IUCN global conservation status of the bird species observed in the study area.
4. To evolve certain measures for the conservation of threatened bird species.

PROPOSED METHODOLOGY

To achieve the planned objectives, following study area and methodology will be used:

A) STUDY AREA

Pong dam lake wildlife sanctuary situated in Kangra district of Himachal Pradesh (Figure 1 & Figure 2) is the selected site for the proposed study.

Pong Lake (reservoir) now called as Maharana Partap sagar lake came into existence with the construction of Earthen Management Dam at a place known as "Pong" across the river Beas which was completed during the year 1975-1976. This is largest man made wet land of Northern India (Singh *et al*., 1990). The Government of Himachal Pradesh proclaimed this wetland as a Wildlife (Bird) sanctuary during 1983 vide Notification No. *Fts. (f) 6-5/82 dated shimla-2, the 01.06.1983*. The final notifications of this wetland as a Wild life sanctuary was issued vide Notification No. *FFE-B-F(6)-11/2005-II/Pong Dam Lake, dated Shimla-2, the 07.06.2013*. This sanctuary was declared a wetland of National Importance by the Ministry of

Environment and Forests, Govt. of India during 1994. The wetland earned the distinction of being among the global class of selected Sites .This is first wetland of the state to have got the global arm of protection and declared a "RAMSAR SITE" in the year 2002.

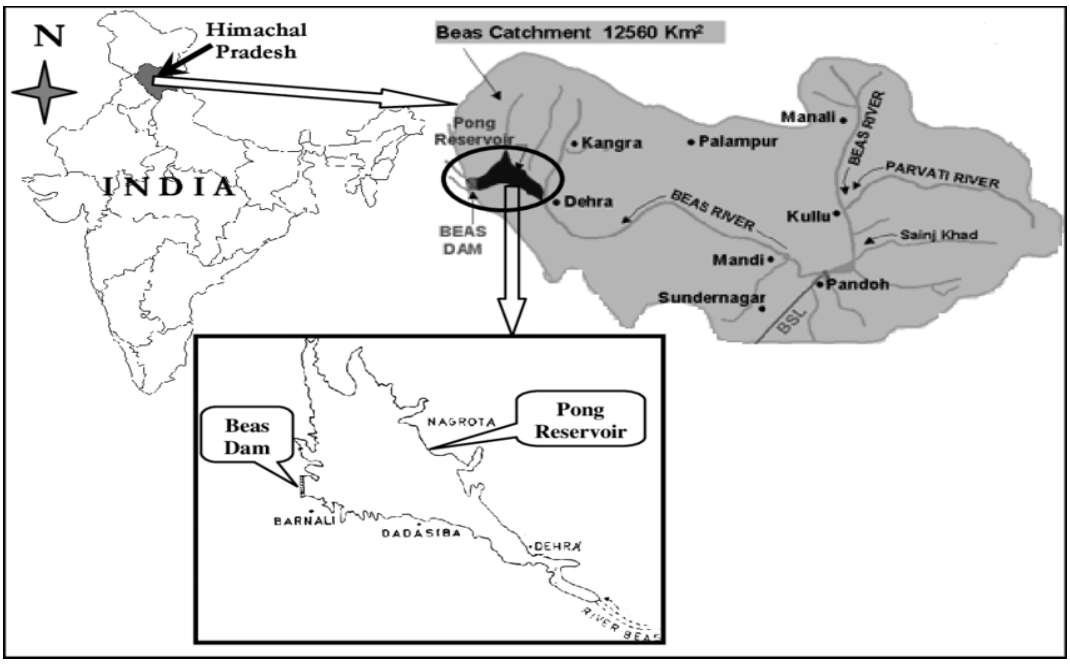
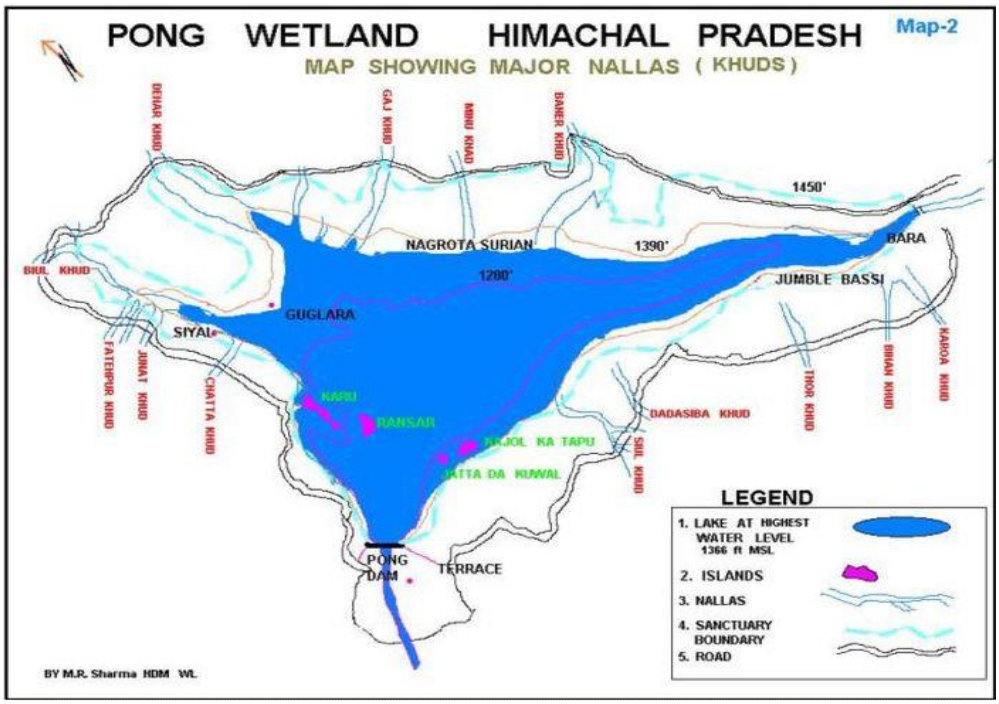


Figure 1: Map showing the location of Pong Dam Lake

Pong dam lake is located in the district Kangra of Himachal Pradesh lies between latitude 31^0 $49^/$ $50^{//}$ to 32^0 $14^/$ $36^{//}$ N and longitude 76^0 $53^/$ $31^{//}$ to 76^0 $17^/$ $53^{//}$ E. It comprises of a total geographical area of 207.59 sq. km, mainly up to 1410 ft. mean sea level falling in Nurpur and Dehra Forest divisions. Its total catchments area of 12562 sq. km. is lying in Kangra, Mandi and Kullu districts with Himalayas in the back ground and Shiwalik foothills in fore-front. This reservoir is 42 Km long and 19 Km wide and having live storage capacity of 7290 million cum. The area of water body varies from 125 Sq Km at minimum water level at 1280 ft in summer season to about 220 Sq Km at the maximum water level of 1390 Feet in rainy season and also leaving behind the maximum draw down area of about 80 Sq Km (Reddy, 2016).



(Source: HP Govt. Forest Department)

Figure 2: Map of Pong Dam Lake Wildlife Sanctuary

The climate of the region is sub-tropical. The summer season extends from mid-March to mid July and the monsoon season is from early July to mid-September. Winters are mild, starting in early December and lasting till mid-March. The temperatures range from a maximum 47°C in summer to a low of 3.5°C in winter. The rainfall is generally heavy and continuous from July to September. Grasses dominate the flora of the entire wetland. There is some submerged aquatic vegetation in the reservoir also, but due to the frequent seasonal changes in water level, the shoreline does not support extensive areas of emergent vegetation. The surrounding hillsides still have some mixed deciduous and pine forest. The islands in the reservoir have been almost completely deforested by the forest department and the labour force. There is an extensive swamp with reed beds and grasslands in the seepage area below the dam (Saxena, 2013).

Main tree species of the tract having attraction for the bird are acacia, jamun, shisham, mango, mulberry, ficus, kachnar, amla and prunus. Apart from these tree

species a variety of shrubs grasses and climbers are also found in these forests. The wildlife species found in Pong dam wetland are nilgai, sambhar, barking deer, wild boar, common monkey, jackal, leopard, jungle cat, mongoose, pangolin, bats, snake, butterflies etc. The wetland attracts numerous species of migratory and resident birds and is an important wintering area for a large number of black headed gulls, brahminy ducks, bar headed geese, shovelers, plovers, grebes, cormorants, darters, herons, moorhens, egrets, storks, ruddy shelduck, pintails, coots, pochards, gulls, grebes, mallards etc. A large variety of fish such as mahaseer, katla, minor carps, rohu, singhara etc are found in the Pong dam and its tributaries.

B) METHODOLOGY

1. To study the diversity and habitat use pattern of avifauna in Pong dam lake wildlife sanctuary, Kangra, Himachal Pradesh.

A consecutive three months preliminary field survey will be conducted to examine the different transects, points and habitat in the study area. After the preliminary survey, periodic field visits will be designed at selected line/point transects of the study site to document the assemblage of bird communities. The study area will be surveyed with the help of scan sampling methodology (Altmann, 1974) and line transect methodology (Gaston, 1975; Sutherland *et al.,* 2005). Monitoring of the avian species will be done with the help of binoculars and use of digital/DSLR cameras to capture their photographs. Standardized handbooks and Field guides (Ali, 2002; Arlott, 2015; Grimmett *et al*., 2014) along with authenticated avian database (IUCN Red list of Threatened Species, Oriental Bird Club image database) will be used to identify the characteristics features of avian species. The nomenclature, classification of species will be prepared in the form of checklist as per order, family, genus and species using Praveen *et al*. (2016).

The habitat use pattern of reported avifaunal species will be assessed on the basis of the type of habitat viz. deep water, shallow water, marshy areas, Islands, forest land, agricultural fields etc., being used by the majority members of the bird species. This

man-made water body has created five main types of avian habitats in the reservoir area- open deep water; mudflats and mud spits along the receding shoreline formed from October onwards; dry sand banks with little or no vegetation; waterside vegetation and swamps below the outfall from the dam; and shallow water at the margin of reservoir (Saxena, 2013).

2. **To elucidate the comparative relative abundance and residential status of the reported bird species.**

The seasonal/monthly variations of avifaunal diversity will be computed in different months of two seasons of the year:

- Summer (April-September) and
- Winter (October-March).

Residential/Migratory status of avifauna assemblages at study area will be evaluated according to presence or absence methodology following Grimmett and Inskipp (2003); Arlott (2015) and other relevant literature. The avifauna will be considered as Resident or Migratory (summer migratory/winter migratory) on the basis of their sightings i.e. throughout the year or during a particular time period.

Table 1. Residential/Migratory status criteria of recorded avifauna

Residential status	**Consideration Criteria**
Resident (R)	Species documented throughout the year
Summer Migratory (SM)	Species reported during summer season (April-September)
Winter Migratory (WM)	Species observed during winter season (October-March)

The assessment of the abundance status of observed Residential avian species will be done on the basis of frequency of sightings of birds in study areas, categorized by following criteria:

Table 2. Abundance status criteria of recorded Residential avifauna

Abundance status	Consideration Criteria
Abundant (A)	Abundant number of sightings (80-100% of field visits) / Abundant number of birds seen.
Common (C)	Regular sightings but less than A (50-79% of field visits) / Moderate number of birds seen.
Uncommon (UC)	Occasional sightings (10-49% of field visits) / Moderate number of birds seen.
Rare (R)	Hardly visible (sightings in 1-9% of field visits) / Few birds seen.

The abundance status of observed Migratory avian fauna will be assigned on the basis of frequency of direct sightings in Summer (April-September) and Winter (October-March) seasons.

3. To assess IUCN global conservation status of the bird species observed in the study area.

The assessment of the status to the species will be based on the following Red List Categories adopted by International Union for Conservation of Nature (IUCN, 2019) that deals with global conservation status of plant and animal species:

- Critically Endangered (CR): A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future i.e. ≥ 90% reduction in the population of a given species over the last 10 years or three generation where causes are reversible, understood and ceased.
- Endangered (EN): A taxon is Endangered when it is facing a very high risk of

extinction in the wild in the near future i.e. ≥ 70% reduction in the population of a given species over the last 10 years or three generation where causes are reversible, understood and ceased.

- Vulnerable (VU): A taxon is Vulnerable when it is facing a high risk of extinction in the wild in the medium term future i.e. ≥ 50% reduction in the population of a given species over the last 10 years or three generation where causes are reversible, understood and ceased.
- Near threatened (NT): A taxon is near threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for, or is likely to qualify for, a threatened category in the near future.
- Least concern (LC): A taxon is Least Concern when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
- Data deficient (DD): A taxon is Data deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/ or population status.
- Not evaluated (NE): A taxon is not evaluated when it is not yet been assessed against the criteria.

Listing of the population trends of recorded avian species at study sites, various population trends such as Increasing (↑), Decreasing (↓), Stable (→) and Unknown (?) will be assigned on the basis on Red List Criteria given by IUCN.

4. To evolve certain measures for the conservation of threatened bird species.

On the basis of periodic field visits conducted during the study period at the study site, the factors that are found responsible for any kind of negative impact on avian fauna will be observed and appropriate strategies for conservation of threatened bird species will be evolved.

SIGNIFICANCE OF THE STUDY

- The outcome of study will be helpful in conserving those avian species which are globally threatened but abundant as well as rare in the study area.
- Further long term monitoring of avian species will result in conserving bird populations and communities which ultimately will help in maintaining wetland nutrients cycles and will also assess the anthropogenic disturbance in study area for long term management practices.

RESEARCH PLAN SCHEDULE

First year plan

1. Collection and consultation of the relevant literature.
2. Regular visits to the selected study sites to collect the relevant information according to proposed objectives.
3. Identification of avifauna species on the basis of standardized handbooks and field guides.

Second year plan

1. Collection and consultation of relevant literature will be continued.
2. Regular visits to the selected study sites and identification of species will be continued.
3. Presentation of recorded data in the form of research papers in National/International Symposia.

Third year plan

1. Statistical analysis of the data and interpretation of results.
2. Presentation of result in the form of research papers in National/International Symposia.
3. Compilation and submission of work in the form of thesis.

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